

City of Torrance

DECIBEL INFORMATION FACT SHEET

WHAT IS A DECIBEL (Db) ?

According to Webster, a decibel is “a unit for measuring the relative loudness of sounds,” with each unit approximately equal to the smallest degree of difference (in sound intensity) ordinarily discernible by the human ear.

WHAT IS AN “A-WEIGHTED” DECIBEL, Db (A) ?

The ear does not always respond equally to sounds having equal amounts of acoustic pressure (or energy) occurring at different frequencies. Thus, not all of a sound’s energy is perceived as loudness by the human ear when the sound occurs at a frequency which approaches the limits of the ear’s frequency response range. The “A-weighting scale” is a mathematical system which was developed so that sounds having various energy levels and frequencies could all be evaluated in terms of relative perceivable loudness. On the A-weighting scale” 1 dB(A) represents the faintest sound normally discernible by humans; and 130 dB(A) represents the level at which sound-caused physical injury can be typically expected.

HOW BIG IS A DECIBEL?

Let’s assume that on a linear scale the distance between each 10 decibels is 1/2 inch, as illustrated below:

0 10 20 30 40 50 60 70 80 90 100

As represented here, each decibel is the same size. However, sound is NOT measured on a linear scale but on a logarithmic scale in which every unit of ten A-weighted decibels is TWICE the size of the unit it follows. In the case of 0 to 100 decibels, with 1/2 inch representing the distance between

0 and 10 decibels, it would require a chart 42.6 feet in length to show the actual logarithmic scale. The interesting concept of this logarithmic scale is that in order to achieve a FIFTY PERCENT reduction in PERCEIVED noise, you need only to decrease the decibel reading by TEN decibels.

IS IT POSSIBLE FOR AIRCRAFT TO DO THIS?

There are so many variables in both the flight characteristics of aircraft and in their levels of noise emission that it is unrealistic to make a blanket statement. There is, however, much data which has been gathered and analyzed in two basic areas- the DEPARTURE and the TOUCH-AND-GO.

The following type aircraft have participated in noise evaluations for straight-out DEPARTURES:

MAKE/MODEL	HORSE POWER	SENEL WITHOUT ABATEMENT	SENEL WITH ABATEMENT	SENEL REDUCTION
Beech 35	250	90.5	81.5	9.0
Beech A-36	285	93.0	83.8	9.2
Beech B-90	1100	83.2	74.2	9.0
Cessna 172	160	81.7	73.3	8.4
Cessna 177	180	81.0	69.3	11.7
Cessna 182	230	86.2	75.9	10.3
Cessna 310	520	88.6	78.7	9.9
Mooney MK20F	200	80.2	65.0	15.2
Piper PA 32-260	260	95.2	73.6	21.6

The following analysis of actual TOUCH-AND-GO operations performed by Cessna 150 aircraft indicates that a reduction of up to 9 decibels is possible for each operation, depending upon the point of touchdown/liftoff.

TOUCHDOWN	LIFT OFF	AVERAGE SENEL dB (A)
300'	1100'	77.6
300'	1900'	82.1
700'	1100'	79.8
700'	1500'	80.4
700'	1900'	80.2
700'	2300'	81.4
700'	2700'	81.1
1500'	3100'	83.8
1900'	3100'	85.5

Further analysis show that a turn at Hawthorne Boulevard provides a reduction of up to 16 decibels, as opposed to a WIDE turn over Ocean Avenue.

AVERAGED SENEL OCEAN AVE. TURNS	AVERAGED SENEL HAWTHORNE BLVD. TURN	SENEL REDUCTION
82.0	76.8	5.2
79.8	68.2	11.6
80.6	64.4	16.2

WHAT DOES IT ALL MEAN?

In each of the above cases, the aircraft was flown according to the operations manual and in a configuration considered to be SAFE by the pilot. In the cases cited, elimination of unnecessary noise provided for an overall noise reduction of 22 percent.

The elimination of UNNECESSARY noise is what the Torrance Airport Noise Abatement Program is all about!

WHAT IS SENEL?

The Single Event Noise Exposure Level (SENEL) is a noise measurement used to describe the total impact of aircraft generated noise events.

The SENEL considers both the MAXIMUM SOUND LEVEL of the aircraft and the DURATION of the sound above a threshold level. High maximum sound levels and long duration factors can, in themselves, be bothersome; but when both occur simultaneously, individuals on the ground are very likely to be annoyed. Consider, for example, that the average duration for a passing vehicle is 6 - 10 seconds from the time it is first heard (above the threshold or background noise level) until it disappears. The average duration for a general aviation aircraft flying overhead is 14 to 24 seconds, and in a few cases, as long as 30 or more seconds. If the aircraft's maximum sound level is approximately the same as an automobile, but its duration is 3 or 4 times as long, the impact of the aircraft over flight will be SUBSTANTIALLY greater than that of the automobile.

Sound is typically transmitted efficiently through the air. As a result, placing an additional 50, 100, or 200 feet between an aircraft and a noise receiver on the ground will likely contribute little to noise abatement if the aircraft generates substantially more noise attaining the additional distance. Because of this relationship, ALTITUDE becomes an effective noise abatement measure only if it is achieved prior to reaching the residential community. Climbing for altitude at full power over residential communities is not an effective noise abatement technique. Thorough knowledge of your aircraft operator's manual is very helpful in determining which airspeed and rate-of-climb combination will be the most effective in achieving the lowest possible SENEL.